

# **ENCLOSED SPRING MECHANISM FOR TRAILER RAMP DOORS**

## **Specification**

### **BACKGROUND OF THE INVENTION**

#### **1. Field of the Invention**

This invention relates to spring mechanisms for opening and closing trailer ramp doors that are fully covered when the ramp doors are closed to prevent rusting and deterioration due to exposure to the elements.

#### **2. Description of the Prior Art.**

Prior art spring mechanisms for trailer ramp doors as known to applicant have no protection from the elements when the ramp doors are closed and are thus subject to corrosion and rusting. Applicant is unaware of any prior art that provides a spring mechanism for trailer ramp doors that is fully enclosed when the ramp door is closed.

### **OBJECTS OF THE INVENTION**

It is an object of this invention to provide a spring operated ramp door for trailers in which the spring is protected from corrosion or rusting due to exposure to weather elements.

Another object of this invention is to provide a spring mechanism to open and close a trailer ramp door which is hidden from view and protected from weather elements by enclosing it in a ramp door frame when the ramp door is in the closed position.

A further object of this invention is to improve safety in the operation of closing and opening a trailer ramp door by enclosing springs used to operate the ramp door in the

1 trailer rear entrance frame.

2 A yet further object of this invention is to integrate  
3 spring mechanisms for opening and closing a trailer ramp  
4 door within the trailer rear entrance frame to facilitate  
5 movement of the ramp door.

#### 6 BRIEF DESCRIPTION OF THE DRAWINGS

7 Figure 1 is a rear perspective view of a conventional  
8 ramp trailer with its ramp door open.

9 Figure 2 is a rear perspective view of a conventional  
10 ramp trailer with its ramp door closed.

11 Figure 3A is a perspective view of a conventional or  
12 prior art ramp spring in its open position after the ramp  
13 door has been fully opened.

14 Figure 3B is a perspective view of a conventional or  
15 prior art ramp spring in its closed position after the ramp  
16 door has been fully closed.

17 Figure 3C shows the details of the prior art connection  
18 of the bottom end of a ramp spring.

19 Figure 4A is a perspective view of an embodiment of the  
20 invention showing the ramp spring in its open position  
21 after the ramp door has been fully opened.

22 Figure 4B is a perspective view of an embodiment of  
23 the invention showing the ramp spring fully enclosed after  
24 the ramp door has been fully closed thereby closing the  
25 ramp spring fully into a slot in the side of the ramp frame  
26 and hiding it from view.

27 Figure 4c shows the details of the connection of the  
28 top end and bottom end of the ramp spring to be enclosed

1 using a spring yoke assembly.

2 Figure 5 is a cross sectional view taken along line 5-5  
3 of Figure 4B showing the ramp spring in its closed position  
4 after the ramp door has been fully closed.

5 **DETAILED DESCRIPTION OF PRIOR ART AND A PREFERRED**  
6 **EMBODIMENT OF THE INVENTION**

7 **PRIOR ART**

8 A conventional ramp trailer 10 is shown in Figure 1  
9 with its ramp door 12 in a fully open or down position.  
10 Conventional or prior art springs 14, one of which is shown  
11 in Figures 3B and 4B, are used in pairs to facilitate the  
12 opening and closing of ramp door 12. One prior art spring  
13 14 is connected at its top end 18 to the outer surface 19  
14 of each side member 20 of trailer rear entrance frame 22  
15 and at its bottom end 24 to the outer surface 26 of each  
16 longitudinal flange 28 integrally formed on each side  
17 member 27 of ramp door frame 29 of ramp door 12. Trailer  
18 rear entrance frame 22 is preferably made of hollow  
19 rectangular steel tubing throughout its frame 22.

20 The top end 18 of prior art spring 14 terminates in a  
21 flat plate 30 having a hole 32 in its center. Each side  
22 member 20 of ramp door frame 22 has attached to it the top  
23 end 18 of prior art spring 14. A yoke assembly 34 is used  
24 for the attachment of the top end 18 and is made up of  
25 spring yoke 36, clevis pin 38 having a head 40 and a hole  
26 42 in the tail end of its shaft 44, and cotter pin 46.

27 Spring yoke 36 is a unitary component in the form of  
28 two parallel triangularly shaped side members integrally

1 joined at their widest side by a U-shaped arch, each side  
2 member having a hole 48 near its triangular apex.

3 Each top end 18 of each prior art spring 14 is secured  
4 to outer surface 19 of corresponding side member 20 of  
5 trailer rear entrance frame 22 as follows:

6 First, spring yoke 36 is securely mounted by any  
7 suitable means such as welding to the outer surface 19 of  
8 side member 20. Next, flat plate 30 is inserted into the  
9 space between side members of spring yoke 36 with hole 32  
10 of flat plate 30 congruent with holes 48 of spring yoke 36.  
11 Then, clevis pin 38 is inserted through holes 48 and hole  
12 32 of flat plate 30. Finally, cotter pin 46 is inserted  
13 into hole 42 in the tail end of clevis shaft 44, whereby  
14 each top end 20 of each prior art spring 14 is firmly  
15 secured to each corresponding side member 20 of trailer  
16 rear entrance frame 22.

17 Each bottom end 24 of each prior art spring 14  
18 terminates in a flat plate 52 with a center hole 54.

19 Each bottom end 24 of each prior art spring 14 is  
20 securely attached to the outer surface 26 of each  
21 corresponding longitudinal flange 28 of ramp door frame 29.  
22 The attachment comprises a threaded rod 54 welded or  
23 otherwise securely mounted at its inner end to the outer  
24 surface 26 of longitudinal flange 28 and having its outer  
25 end inserted into hole 54 of flat plate 52. A hexagonal  
26 threaded nut 60 is threaded onto rod 54 to secure bottom  
27 end 24 of each prior art spring 14 to the outer surface 26  
28 of longitudinal flange 28. When ramp door 12 is closed,

1 thereby closing the flange 28 on each side member 20 of  
2 trailer rear entrance frame  
3 22, springs 14 remain exposed to the elements since the  
4 closure of flanges 28 does not cover springs 14 at all as  
5 shown in Figure 3B.

6 This arrangement permits corrosion and rusting of prior  
7 art springs 14 from precipitation of various types from  
8 weather conditions as well as exposure to sunlight, all of  
9 which shortens the life of prior art springs 14 and  
10 increases the danger of breakage of prior art springs 14.

#### 11 **PREFERRED EMBODIMENT OF THE INVENTION**

12 The invention uses the same type of prior art springs  
13 14, but has a different arrangement for them. For purposes  
14 of convenience and clarity, the springs of the invention  
15 will have a different identification number, 61.

16 Springs 61 are preferably 36 inches in length and have  
17 a diameter of 2.00 inches. A suitable type of spring used  
18 in the invention is identified as 3W36 garage door spring  
19 available from Century Spring Corp., 222 E. 16th Street,  
20 Los Angeles, CA 90015. This spring has a tensile strength  
21 of 165-185 lbs., and will withstand a maximum safe load of  
22 up to 340 lbs. This spring comes with each end terminating  
23 in a flat plate and is made of spring steel with a length  
24 of 36 inches and a diameter of 2 inches. Other springs may  
25 be used provided they have equal capabilities.

26 In the invention, the bottom ends 62 of springs 61, each  
27 terminating in a flat plate 64 with a central hole 66, are  
28 attached to the inner surfaces 68 of longitudinal flanges

1 70 integrally formed from each side member 72 of ramp door  
2 frame 29 as illustrated in Figure 4A.

3 The width of longitudinal flanges 70 is preferably 3  
4 1/2 inches, but any other width that provides complete  
5 coverage of springs 61 may be used. The width of flanges 70  
6 is almost twice the width of the prior art flanges 28.

7 This attachment is effected by a yoke assembly 74,  
8 comprising spring yoke 76, clevis pin 78 having a hole 80  
9 in the tail end of clevis shaft 82, and cotter pin 84. The  
10 yoke assembly 74 is used to attach bottom ends 62 of  
11 springs 61 to longitudinal flanges 70 of ramp door frame  
12 29.

13 Yoke assembly 74 has the same components and design of  
14 yoke assembly 34 but has new identification numbers for all  
15 of its component parts for purposes of convenience and  
16 clarity.

17 The bottom of spring yoke 76 is securely attached to  
18 the middle of the inner surface 68 of flange 70 by welding  
19 or other suitable means. Flat plate 64 of spring 61 is  
20 inserted into spring yoke 76 and kept in position by  
21 insertion of clevis pin 78 having a head 79 through holes  
22 86 of spring yoke 76 and hole 66 of plate 64. Clevis pin 78  
23 is secured by inserting cotter pin 84 into hole 80 at the  
24 tail end of clevis pin 78, whereby each spring 61 is  
25 securely attached to the middle of the width of  
26 corresponding inner surface 68 of a longitudinal flange 70  
27 at a location preferably about 20 inches from the bottom of  
28 ramp door frame 29. This location may be varied up or down

1 up to several inches depending on the length of springs 61  
2 and their strength.

3 The invention has modified the tubular rectangular side  
4 members 20 of trailer rear entrance frame 22 to produce  
5 side members 88 by cutting longitudinal slots 89 in the  
6 outer surface 90 of side members 88. The slots 89 are  
7 preferably 45 inches long and 2 1/4 inches wide. The side  
8 members 88 are about 2 inches deep. Other dimensions may be  
9 used so long as the slots 89 are able to contain springs 61  
10 that are completely closed by flanges 70 when ramp door 12  
11 is closed.

12 The tops 92 of slots 89 are preferably located about 64  
13 inches from the bottom of trailer rear entrance frame 22.  
14 However, the location may be varied up to several inches up  
15 or down depending upon the length of springs 61 in relation  
16 to the length of slots 89 and their strength.

17 Similarly, the bottoms 94 of slots 89 are preferably  
18 located about 19 inches from the bottom of trailer rear  
19 entrance frame 22 but this distance may be varied up or  
20 down several inches depending on the length of the springs  
21 61 and length of slots 89.

22 The top ends 100 of springs 61 each terminate in flat  
23 plates 102 having holes 104 in their centers. Another set  
24 of yoke assemblies 74 are used to securely attach top ends  
25 100 to the inner surfaces 106 of each side member 88 by  
26 introducing top ends 100 through slots 89.

27 Spring yoke 76 is securely mounted by any suitable  
28 means such as welding to the inner surface 106 of side

1 member 88. Next, flat plate 102 is inserted into the space  
2 between side members of spring yoke 76 with hole 104 of  
3 flat plate 102 congruent with holes 86 of spring yoke 76.  
4 Then, clevis pin 78 is inserted through holes 86 and hole  
5 104 of flat plate 30. Finally, cotter pin 84 is inserted  
6 into hole 80 in the tail end of clevis shaft 82, whereby  
7 each top end 100 of each spring 61 is firmly secured inside  
8 slot 89 to the inner surface 106 of each corresponding side  
9 member 88 of trailer rear entrance frame 22.

10 In operation, when ramp door 12 is being opened and is  
11 being lowered to a completely flat position, springs 61  
12 provide dampening of the downward movement of ramp door 12  
13 which provides a controlled motion of ramp door 12 as it  
14 moves down.

15 When ramp door 12 is being closed from its completely  
16 open position, springs 61 provide substantial lifting  
17 assistance since ramp door 12 weighs about 180 pounds.

18 When ramp door 12 is completely closed, springs 61 are  
19 completely enclosed in slots 89 by flanges 70 and are  
20 protected from corrosion or rusting from weather elements,  
21 thereby substantially increasing the life of springs 61,  
22 and providing safety to consumers in the event of any  
23 breakage of springs 61.

24 Although I have described the invention in detail with  
25 reference to the accompanying drawings illustrating pre-  
26 ferred embodiments of the invention, it is understood that  
27 numerous changes may be made in the details of construction  
28 and arrangement of parts without departing from the spirit



and scope of the invention as hereinafter claimed.